## ST. JOHNS LANDFILL SLOPE RESTORATION ANNUAL PLANT ESTABLISHMENT MONITORING REPORT

Prepared for:

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#### **TABLE OF CONTENTS**

1.0	INT	FRODUCTION	
	1.1	General Information	1
	1.2	Project Summary	
2.0	PEF	RFORMANCE STANDARDS	
	2.1	General Information	1
	2.2	Contract Requirements	1
3.0	APF	PROACH & METHODOLOGY	
	3.1	General Information	2
	3.2	Monitoring	2
4.0	FIN	DINGS & RECOMMENDATIONS	
	4.1	General Information	
	4.2	Findings	3-4
	4.3	Recommendations	

### LIST OF FIGURES

Figure 1	Plant List, Weeds and Overv	iew of site conditions	6
Figure 2	Site Plan with Transects & p	hoto points	8

### LIST OF APPENDICES

Appendix A Transect Data Appendix B Site Photos

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#### 1.0 INTRODUCTION

#### 1.1 General Information

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This document reports on the establishment success of native plants installed during slope restoration activities at St. Johns Landfill. A Type II Land Use Decision with Conditions of Approval was issued by the City of Portland Bureau of Development Services for two sites included under this construction contract, N. Portland Road and St. Johns Landfill. The Conditions of Approval did not specify survival rates for plantings at the St. Johns Landfill, however the Owner instituted success criteria in the Construction Documents due to the construction site's proximity to Smith and Bybee Lakes, and North Slough, and its inclusion in the Smith and Bybee Lakes Natural Resources Management Plan.

#### 1.2 Project Summary

Metro implemented the construction project at St. Johns Landfill to correct areas of differential settlement on the landfill surface. Since the closure of the landfill, decomposition and settling of the contents have resulted in the formation of depressions and ponds. The primary goal was to fill these depressions to prevent damage to the landfill liner and water infiltration.

The construction was performed by Brant Construction, Vancouver, Washington in Summer and Fall 2003. The project site was approximately 9.5 acres, with 1.6 acres in native trees and shrubs, and 7.9 acres seeded with a native grass seed mix. The site was seeded upon completion of grading activities in late Fall 2003. Native plants were installed in February 2004.

#### 2.0 PERFORMANCE STANDARDS

#### 2.1 General Information

The specification Section 02900 - Landscaping is included in the Contract Documents and defines the Special Warranty and the Success Criteria for plant material at the site. The Type II Land Use Review conducted by the City of Portland, Bureau of Development Services did not include success criteria of plant material for the St. Johns Landfill site in the conditions of approval.

#### 2.2 Contract Requirements

The plant warranty shall be for three years from substantial completion for trees, shrubs, groundcovers and grass seed establishment. The Success Criteria for plant material is defined as 100% survival of trees larger than ½' caliper, 80% survival of smaller trees and shrubs, 80% survival of groundcovers. Satisfactory grass seed establishment is defined as having no bare spots larger than 3 square feet, not more than 10 percent of total area with bare spots larger than 6 inches, and not more than 15 percent of total area with bare spots larger than 3 inches.

#### **3.0 APPROACH & METHODOLOGY**

#### 3.1 General Information

Several informal site visits were conducted between the completion of planting in February 2004 and October 2004. Formal monitoring transects and photostations were established during the first annual monitoring review on October 20<sup>th</sup> and 21<sup>st</sup> 2004. These have been located in AutoCad and in the field allowing for repetition of the assessment over the coming years.

#### 3.2 Monitoring Methodology

The site was visited on October 20 and 21, 2004 to review site conditions and assess vegetation establishment and condition. The final planting diverged substantially (not statistically assessed) from the planting plans included in the construction documents, and a detailed as-built plan was not available. Due to the variety of plant communities, densities, and success rates evident throughout the site an approach that combined quantitative and qualitative methods was used to evaluate the site.

The site was divided into transects spaced at 100 foot intervals. The transects cross the swale starting on the east side and end on the west side. The first transect,  $0^{A} - 0^{B}$ , is located at the culvert at the north limit of the site. From that point, transects were established at 100 foot intervals along the centerline of the swale. The last transect,  $11^{A} - 11^{B}$  is located at the east end of the swale at the edge of the plantings. It is 50-feet from transect 10 due to the length of the planted area. Transect ends were marked with 24 inch orange-tipped wooden stakes that are labeled with the transect number. The stakes were left in the field for future monitoring.

A 100-foot tape was stretched from T<sup>A</sup> stake (0-feet) to the T<sup>B</sup> stake to evaluate each transect. Transect lengths varied from about 35-feet to 75-feet to correspond to the width of the planted area at each location. An area approximately 10-feet wide, five feet on either side of the tape, was evaluated. Data collected included the quantity, species and condition of all observable planted material along the transect including the location of the material. Location was recorded as the distance from the T<sup>A</sup> stake along the transect. Dominant weeds along the transect were also recorded.

Two photo stations were established for each transect. One photo was taken looking from the  $T^A$  stake to the  $T^B$  stake, along the transect. A second photo was taken from the middle of the transect looking south and/or east to the next transect. The photo at transect 11 was taken looking to the west, back along the project site.

Additional qualitative information was collected for the planted areas between the transects. For each area a list of all visible planted species was generated. General observations of species dominance, species survival and condition (% surviving or thriving compared to % dead or struggling), and significant weed populations were recorded. This method did not account for dead plants that were missing or not visible as there was no means to detect them, but did provide a general view of how specific species were doing in specific locations of the site within certain sub-areas of the site. This qualitative information was used to guide recommendations on the location of replacement plant material.

#### 4.0 FINDINGS & RECOMMENDATIONS

#### 4.1 General Information

The weather on the survey day was partly cloudy and 55 degrees. Precipitation in the month of October was about 2 inches. This is slightly above average. However, precipitation in Portland between January 1<sup>st</sup> and October 21<sup>st</sup> was about 4.5 inches below the average rainfall of 24.5 inches. This drier than normal condition is likely to have affected plant mortality (Spring 2004 was the driest of record).

Data sheets summarizing the precise findings along each transect are included in Appendix A. Photos of each transect are included in Appendix B. Figure 1 is a list of plant material and quantities installed, and general condition observed after one growing season. Figure 2 shows the transect and photostation locations on the site.

# 4.2 Findings Summary 1) Cascara (Rhamn 2) Madrone (Arbut 3) Red-tw: Net UNCENN 3)

- 1) Cascara (Rhamnus purshiana) are all severely stressed or dead. Do not replant.
- 2) Madrone (Arbutus menziesii) none noted. several @ send doing well?
- 3) Red-twig dogwood (Cornus stolonifera) significant mortality throughout the site, /especially at T2 (approx. 75%), T5 and T6 (33%). Likely that site is too dry for live
- V stakes to establish well. Possible that plants would be more successful, but only in limited quantities and located in wettest areas.
- 4) Hawthorn (Crataegus douglasii), oceanspray (Holodiscus discolor), and vine maple (Acer circinatum) didn't occur on any transects. A few specimens were noted. Vine maple are struggling, hawthorn and oceanspray stressed but surviving.
- 5) Spirea (Spiraea douglasii) survival looks good by the numbers, however large quantities of empty sleeves at T1 and T4, where dominant species is spirea, make it likely that the missing/dead plants were in fact also spirea. This would indicate 30-50% mortality. Site is likely too dry for this species. Don't recommend replacing unless absolutely necessary and then only in wettest areas.
- 6) Big-leaf maple (Acer macrophyllum) seem to be doing well. May be suitable as replacement tree in upland areas.
- Oregon ash (Fraxinus latifolia) doing well, although only noted around T5. Questionable how well they would do beyond the wettest areas. Could be extended around willows.
- 8) Oregon grape (Mahonia aquifolium), red and blue elderberry (Sambucus racemosa, S. cerulea) are healthy and vigorous in all cases. Oregon grape was primarily noted on west slope of swale, elderberry on east slope. Unclear if this is where they were planted, or if this is just where they were successful. Recommend extensive use of all three in replacement effort. Elderberries are being inhibited by browsing guards. Recommend removing existing guards and not placing on new plants.
- 9) Red flowering current (Ribes sanguineum), mock orange (Philadelphus lewisii), clustered rose (Rosa pisocarpa), black cap (Rubus leucodermis) and thimbleberry (Rubus parviflorus) seem to be surviving but not thriving in most cases. Unclear if this is a function of extreme dry year or a trend that will continue in decline to death.

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Of these species clustered rose and thimbleberry seem most likely to succeed and best suited for replacement planting.

- 10) Mountain balm (Ceonothus velutinus) and mock orange (Philadelphus lewisii) often occur together on upper slopes. Approximately 60 -70% survival. Mountain balm is either thriving or dead. May be successful in replacement if planted with care. Mock orange generally alive but quite stressed.
- 11) Indian plum (Oemleria cerasiformis), only a few specimens were noted and those were so severely stressed as to render them almost unrecognizable. Do not replant.
- 12) Herbaceous plants- of the approx. 2000 installed few were evident on the site. Sedges were only noted at the northeast corner of the willow thicket (between T5 and T6), with none occurring along transects. Lupine was more evident throughout site, however it was difficult to distinguish if specimens noted were planted or volunteers from existing seed bank. Dry growing season probably contributed to loss of emergent plants, but site is also likely too dry to sustain them beyond the lowest and wettest areas. Don't recommend replacing.
- 13) Hydroseed on balance of construction site appears to have only marginally established. The north / west portion of the project that was completed and seeded first has the best cover. The south / east portion that was seeded in late Fall 2003 has only marginally established with significant areas of weeds and bare areas. The coir erosion control fabric is easily visible.
- 14) Significant weed issues were noted at all transects. See specific transect notes for weed details. Bindweed, bull and Canada thistle, geranium, mustard, vetch and pigweed are extensive throughout the site. Blackberry and reed canarygrass are only in limited areas, but should be addressed before they establish further.

#### 4.3 **Recommendations**

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The transects accounted for review of existing conditions on approximately 10 percent of the site, a 10 foot wide transect every 100 feet. 206 plants were observed in the field, of these 64 were dead, resulting in an estimated mortality rate of 31 percent. The actual mortality rate is actually higher because plants that completely disappeared were not accounted for in these numbers. Per the contract documents the site shall be restored to 80 percent survival at the end of each monitoring season. The estimated percentage of replacement is 11 percent (31% - 20%)acceptable mortality = 11% replacement). We recommend increasing this number to 15 percent (et least to account for plants that are entirely missing. The quantity of plants to be replaced is 412.

- 1) Per the findings above, we recommend use of the following plants for the warranty replacement. Replacement planting should occur in Fall 2004 to encourage some establishment prior to Spring 2005 in the event of another dry growing season.
  - Oregon ash and clustered rose in low/wet areas with some red-twig dogwood (container plants in lieu of live stakes), Big-leaf maple, Oregon grape, red and blue elderberry on upper slopes,

  - Snowberry throughout site (avoid lowest areas),
    - Limited replanting of thimbleberry, mountain balm and mock orange may also be acceptable in upper areas.

- Reseed large portion of landfill that did not establish a successful stand of grass. Suggest waiting until spring to reseed due to late season and lack of success last year at same time.
- 3) Weed management is critical throughout most of the swale and in some areas on the upper seeded slope. Extensive spot spraying and multiple applications are likely to be necessary to control bindweed, mustard, geranium, blackberry, reed canarygrass, vetch, and thistle. Recommend spraying this fall and again in spring.

Woody plants should be installed in Fall 2004. The remainder of the site should be reseeded in Spring 2005.

LATIN NAME	COMMON NAME	CODE	QTY	NOTES
Acer circinatum	vine maple	ACCI	15	Saw a few, stressed
Acer macrophyllum	big-leaf maple	ACMA	15	Most were surviving
Arbutus menziesii	madrone	ARME	10	None noted
Ceanothus velutinus	mountain balm	CEVE	30	Planted in clumps along high edges, approx. 60-70% survival
Cornus stolonifera	red osier dogwood	COSE	809	Many live stakes throughout. Overall most appeared stressed, with some areas
				of severe losses. Survival approx. 55%.
Crataegus douglasii	black hawthorn	CRDO	41	Few noted, those surviving but not thriving.
Fraxinus latifolia	Oregon ash	FRLA	150	Seemed to be doing fairly well.
Holodiscus discolor	oceanspray	HODI	50	Only 2 specimens noted
Mahonia aquifolium	tall Oregon grape	MAAQ	250	All specimens noted were healthy and successful
Oemleria cerasiformis	Indian plum	OECE	100	Only 2 specimens noted, severely stressed, few leaves.
Philadelphus lewisii	mock orange	PHLE	90	Planted in clumps along high edges, most appeared to be surviving, but
				severely stressed.
Rhamnus purshiana	cascara	RHPU	60	Only a few living specimens noted, very stressed
Ribes sanguineum	red flowering currant	RISA	100	Most appeared to be alive but struggling.
Rosa pisocarpa	swamp rose	ROPI	280	Appeared to be surviving, isolated specimens were showing severe stress
Rubus leucodermis	black raspberry	RULE	58	Only a handful of specimens noted, most seemed to be doing well.
Rubus parviflorus	thimbleberry	RUPA	50	Planted in groups along high edges, most appeared to be healthy.
Sambucus cerulea	blue elderberry	SACE	100	All specimens noted were healthy and vigorous.
Sambucus racemosa	red elderberry	SARA	40	All specimens noted were healthy and vigorous
Salix sitchensis	Sitka willow	SASI	14	None occurred on transects, but one was noted.
Spiraea douglasii	Douglas spirea	SPDO	200	Most appeared to be alive, but many were showing signs of stress.
Symphoricarpos albus	snowberry	SYAL	300	Seemed to be surviving throughout site. Showing stress in some areas,
· · · · · · · · · · · · · · · · · · ·				particularly those planted in low/wet spots.
Carex obnupta	slough sedge	CAOB	420	Few specimens noted but healthy.
Carex stipata	sawbeak sedge	CAST	1000	Few specimens noted but healthy.
Lupinus polyphyllus	many leaved lupine	LUPO	450	Few specimens noted but healthy.
Scirpus microcarpus	small fruited bulrush	SCMI	200	Few specimens noted but healthy.

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## FIGURE 1. LIST OF SPECIES PLANTED, QUANTITIES, WEEDS AND OVERVIEW OF CONDITIONS NOTED ON SITE (10.21.04).

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LATIN NAME	COMMON NAME	CODE	NOTES
Anthemis cotula	Chamomile	ANCO	
Brassica campestris	Field mustard	BRCA	Dominant along several transects
Chenopodium album	Lamb's quarters (pigweed)	CHAL	
Cirsium arvense	Canada thistle	CIAR	Dominant along several transects
Cirsium vulgare	Bull thistle	CIVU	
Claytonia megarhiza	Miner's lettuce	CLME	
Conium maculatum	Poison hemlock	COMA	
Convolvulus sepium	Hedge bindweed	COSE	
Dipsacus sylvestris	Teasel	DISY	Dense patches in several areas
Echinochloa crusgali	Barnyard grass	ECCR	
Gallium aparine	Cleavers (goose grass)	GAAP	
Geranium molle	Cranesbill geranium	GEMO	Most prevalent / dominant weed species
Hordeum jubatum	Foxtail barley	HOJU	
Lactuca serriola	Prickly lettuce	LASE	
Linaria vulgaris	Butter-and-eggs	LIVU	
Phalaris arundinacea	Reed canarygrass	PHAR	
Plantago lanceolata	English plantain	PLLA	
Rumex crispus	Curly dock	RUCR	
Rubus discolor	Himalayan blackberry	RUDI	Dominant along several transects
Solanum dulcamara	Bittersweet nightshade	SODU	
Stellaria media	Common chickweed	STME	
Taraxacum officinale	Dandelion	TAOF	
Tanacetum vulgare	Tansy	TAVU	
Trifolium repens	White clover	TARE	
Trifolium pratense	Red clover	TRPR	
Vicia sativa	Common vetch	VISA	

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#### LIST OF WEEDS FOUND (10.21.04).

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## Appendix A

Transect 0						
Station 0 ~40	Quantity	Code	Quantity	Code	Notes	Weeds COMA/BRCA
No planted plan	nts along this t	ransect				

Transe	ct 1						
Station	Quantity	Code	Quantity	Code	Notes		Weeds
0	1	E/S					
2	1	E/S					
8.5	1	E/S					
16	1	SPDO					
20	1	E/S	1	SPDO			BRCA
24	1	SPDO			Healthy		м
28	2	SPDO					
31	2	E/S					GEMO
32	1	SPDO					
38	2	E/S					•
42	2	SYAL					
45	1	SYAL	1	ROPI			
49	1	E/S	1	ROPI	ROPI dead		
58	2	ROPI					
66	1	MAAQ			Healthy		п
76		end					BRCA
	20		3		•		
	Tot	al Observed	23	<b>Total Dead</b>	10	43%	Mortality

Transec	ct 2						
Station	Quantity	Code	Quantity	Code	Notes		Weeds
0	5	PHLE			Stressed		
3	1	RUPA					
5	1	RHPU			Dead		
8	1	SACE	1	RHPU	RHPU stressed		
12	2	SYAL					
16	3	COSE			1 Dead		
20	2	COSE			Dead		
23	1	COSE			Dead		
25	1	COSE			Dead		
27	3	COSE			1 Dead		
30	3	COSE			Dead		
33	2	COSE			Dead		
38	2	COSE			Dead		
40	1	COSE			Dead		
43	2	SYAL					
47	1	MAAQ					GEMO-BRCA
55	1	MAAQ					
	32		1				
	Tot	al Observed	33	Total Dead	15	45%	Mortality

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Transe	ect 3				•		
Station	Quantity	Code	Quantity	Code	Notes		Weeds
3	1	RISA					
6	2	RISA			1 Dead		
10	1	RISA			Doing well		
14	1	ROPI					
22	1	ROPI			Small		
25	1	ROPI					
28	2	ROPI					RUDI
34	1	COSE	1	E/S			RUDI
37	1	COSE					RUDI
40	1	E/S					
41	1	COSE					COMA
45	2	COSE					
49	1	RISA					
54	1	E/S					
58	2	E/S					
63	2	E/S					
64	1	MAAQ					
65		end					
	22		1				
	Tot	al Observed	23	<b>Total Dead</b>	8	35%	Mortality

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Transe	ect 4						
Station	Quantity	Code	Quantity	Code	Notes		Weeds
2	2	SPDO					TRRE/CHAL
7	3	SPDO					н
10	2	SPDO					VISA
13	2	SPDO					
16	1	SPDO	1	OECE	Dead		
19	1	SPDO	1	E/S			
23	2	SPDO					
28	1	SPDO	1	E/S			GEMO
31	1	SPDO	1	E/S			•
35	1	SPDO	1	E/S			•
	16		5				
	Tota	I Observed	21	Total Dead	15	24%	Mortality

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Transe	ect 5						
Station	Quantity	Code	Quantity	Code	Notes		Weeds
0	2	COSE			Doing well		Grass
7	1	COSE			Dead		
10	1	FRLA			Marginal		
13	2	COSE			Dead		
15	2	FRLA			Doing well		GEMO
18	2	COSE			•		•
20	2	FRLA					
24	1	FRLA	1	COSE			8
26	2	FRLA					×
31	2	COSE	1	FRLA	FRLA stressed		
32	Ť	COSE					R
37	3	COSE			2 Dead		
42	1	COSE					Grass
44		end					ti
	22		2				
	Tota	l Observed	24	Total Dead	5	21%	Mortality

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Transe	ect 6						
Station	Quantity	Code	Quantity	Code	Notes		Weeds
2	1	COSE					Grass w/
5	1	COSE			Dead		some GEMO
7	1	COSE					H
15	1	COSE					31
19	1	POTR					
SHRUB							
20	1	COSE					GEMO
24	1	E/S					
27	1	COSE					
31	2	COSE			1 Dead		8
35	2	COSE			1 Dead		82
39	1	SASPP	1	E/S			
44	2	COSE					
47	1	E/S					
51	2	E/S					
54	1	OECE			Dead		VISA
55	2	COSE			2 Dead		
	21		1				
	Tota	I Observed	22	Total Dead	d 11	50%	Mortality

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Transe	ct 7						
Station	Quantity	Code	Quantity	Code	Notes		Weeds
0	1	SYAL			Doing well		GEMO
5	1	SYAL			Doing poorly	*	CIAR
8	2	SYAL			Doing well		
12	1	ROPI					
16	2	ROPI					
21	1	COSE					
27	1	SYAL	1	COSE	COSE stressed		
29	1	SYAL			Stressed		
31	1	SYAL					
35	1	SYAL			II		
41	1	ROPI					LUPO
44	1	SYAL					LUPO
51	2	ROPI					
57	1	MAAQ					
	17		1				
	Tota	I Observed	18	<b>Total Dead</b>	0	. 0%	Mortality

Transect 8							
Station	Quantity	Code	Quantity	Code	Notes		Weeds
0	4	CEVE			2 Dead		
10	1	ROPI			Healthy		GEMO
23	1	SYAL			81		н.
34	1	SYAL					
38	1	ACMA					
44	1	ACMA					
51	1	MAAQ					H
- 53	1	MAAQ					8
59	1	RULE		,	Stressed		
60	1	SARA		\$			
64		end					н
	13		0				
	Tota	l Observed	13	Total Dead	12	15%	Mortality

Transect 9							
Station	Quantity	Code	Quantity	Code	Notes		Weeds
2	1	E/S					GEMO &
4	1	SYAL					Grass
9							GEMO
12	1	SYAL					88
15	1	ROPI					
21	1	SYAL					
24	1	SYAL					
30	1	SYAL					
33	1	E/S	1	ROPI			
36	2	RUPA			Dead		
38	1	RISA			Dead		
	11		1				
	Tot	al Observed	12	Total Dead	15	 42%	Mortality

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Γ	Transe	ct 10						
	Station	Quantity	Code	Quantity	Code	Notes		Weeds
	3	5	RUPA	-		Very Good	*	CIAR
	5	2	PHLE			Very Stressed		=
	10	1	SACE			Good		GEMO/Grass
	14	1	E/S			Mown		50/50
	26					Mown		
	29	1	ROPI					•
	36	1	ROPI					
	44	1	MAAQ	1	ROPI			
	49.5	1	MAAQ					н
		13		1			•	
		Tota	l Observed	14	Total Dead	11	7%	Mortality

Transect 11							
Station	Quantity	Code	Quantity	/ Code	Notes		Weeds
0						*	RUDI
5							•
17	1	E/S				*	CIAR >50%
24	1	ROPI					
31	1	E/S					
34		end					
	3		0				
	Tota	al Observed	3	Total Dead	2	67%	Mortality

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Common		Total	Total	Percent	Quantity	Replacement
Species	Name	Observed	Dead	Mortality	Installed	Estimate
E/S	empty sleeve	30	30	100%	0	0
ACMA	big-leaf maple	2	0	0%	15	0
ARME	madrone	0	0	na	10	2
CEVE	mountain balm	4	2	50%	30	5
COSE	red osier dogwood	55	24	44%	809	121
CRDO	black hawthorn	0	0	na	41	6
FRLA	Oregon ash	9	0	0%	150	23
HODI	oceanspray	0	0	na	50	8
MAAQ	tall Oregon grape	9	0	0%	250	38
OECE	Indian plum	<b>2</b> '	2	100%	100	15
PHLE	mock orange	7	0	0%	90	14
RHPU	cascara	2	1	50%	60	9
RISA	red flowering currant	6	2	33%	100	15
ROPI	swamp rose	22	1	5%	280	42
RULE	black raspberry	1	0	0%	58	9
RUPA	thimbleberry	8	2	25%	50	8
SACE	blue elderberry	2	0	0%	100	15
SASI	Sitka willow	1	0	0%	14	2
SARA	red elderberry	1	0	0%	40	6
SPDO	Douglas spirea	22	0	0%	200	30
SYAL snowberry		23	0	0%	300	33
		206	64	31%	2747	302

Appendix B









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